



# PATHOLOGY OF CUTANEOUS TUBERCULOSIS

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# THE PATHOLOGY OF CUTANEOUS TUBERCULOSIS.<sup>1</sup>

BY JOHN T. BOWEN, M.D.,

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IN this paper, that I have the honor to contribute to the discussion upon the subject of cutaneous tuberculosis, I shall confine myself as closely as possible to the anatomy of the various forms of this disease, considering that allied questions often discussed under the head of pathology, will be presented more properly by the other participants.

Under the head of cutaneous tuberculosis, we must include, in the present state of our knowledge, scrofuloderma, lupus, and two other clinical forms that were not until recently admitted to a place in this class. These two forms, the only ones, with the exception of lupus and scrofuloderma, that have offered substantial claim to be considered as distinct varieties, are the miliary tuberculosis\* and tuberculosis verrucosa cutis. We have thus four forms of cutaneous tuberculosis to consider, scrofuloderma, lupus, miliary tuberculosis and tuberculosis verrucosa cutis. The claims of tuberculosis verrucosa cutis to be regarded as a distinct variety have sometimes been questioned, and will be considered in their proper place.

No one doubts to-day that in tuberculosis we have to do with a chronic infectious disease caused by the action of a specific bacillus. The work of Koch and Baumgarten, together with the valuable contributions

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of other investigators, has demonstrated this truth so brilliantly and positively, that no other belief in the domain of pathology can be regarded as more securely established. Furthermore, the same investigators have cleared up the mystery surrounding the term scrofula, by demonstrating that the larger part at all events, of the affections formerly termed scrofulous, are in reality tuberculous troubles, caused by the tubercle bacillus. In proof of this, they have shown that this bacillus is constantly present and capable of culture in generations, and that these cultures when inoculated upon other organisms produce a true tuberculosis. The subject of lupus has also been vastly illuminated by the pathological studies that have followed in the wake of the discoveries of Koch. For a long time searched for in vain, it was finally proved by Koch, Doutrelepon and others, that the bacillus of tuberculosis, although very sparingly represented, could be demonstrated by a prolonged search in sections of lupus tissue, and further experiment showed that it could be cultivated in generations, and produce tuberculosis by inoculation upon animals. The sole pathological proof that to the most skeptical could now be wanting, was the production of lupus itself by inoculation, and although the clinical evidence that lupus may sometimes at least be caused by a direct inoculation of sputum or other material rich in tuberculous virus, is increasing, it must be admitted that experiment has not as yet succeeded in producing this disease in animals. In consideration of the insusceptibility of the lower animals to many forms of human disease, it seems probable that the last doubt will have to be dispelled by an overwhelming accumulation of clinical facts. The anatomist may fairly demand the aid of the clinician, and an intelligent judgment can only be formed by a consideration of all the evidence.



The tubercle, the product of the tubercle bacillus, is a nodule of so-called granulation tissue, composed histologically of small, round cells deeply stained by coloring agents, together with larger cells possessing a clear nucleus, that have been called epithelioid cells, and large cellular elements, with peripherally arranged nuclei and homogeneous centre, the Langhans giant cells. These cells are enclosed between the meshes of connective tissue, and are characterized, in distinction from normal cells, by their instability. Sooner or later a modification begins in the nodule. Its centre becomes necrotic, that is, the cell protoplasm is coagulated, the nuclei lose their power of responding to staining agents, the intercellular substance also takes part in the degeneration, and there results a coagulation necrosis in the Weigert sense, a condition that has been usually termed a cheesy degeneration. This term, cheesy degeneration, has given rise to much confusion. Virchow long ago pointed out that it was in no sense a condition peculiar to tuberculosis. Its use should be restricted to the macroscopical appearance and consistency of certain products of degeneration, dropping the term entirely from the nomenclature of microscopy.

It has been claimed, at various periods in the history of tuberculosis, that both the cheesy degeneration and the Langhans giant cell were pathognomonic of the affection. Neither of them can now be considered as a specific attribute, inasmuch as cheesy degeneration is found, as has been said, in numerous other conditions, and as the Langhans giant cell, while still retaining an especial association with tuberculosis, can frequently be seen in its typical form in the tissue about vessel ligatures, and in several forms of syphilis — notably in gummata and in the small papular or lichenoid variety. Baumgarten's view that those cases of

syphilis in which the Langhans giant cell is found, are a complication of syphilis with tuberculosis, has not been supported by microscopical study nor by experiment. No one has claimed to have found the bacillus of tuberculosis in a gumma, or in a papule of lichen syphiliticus, and experiments upon animals have failed to produce tuberculosis by the inoculation of these syphilitic products. Still, while the Langhans giant cell has lost its claim to be regarded as specific, a certain amount of diagnostic value must be allowed to it, when seen, as there is as yet, so far as I am aware, no record of its discovery in pathological processes other than those of tuberculosis and syphilis.

While it may be said that the course and life history of the tubercle, together with its tendency to progress in the adjacent tissue are to some extent specific, the sole feature that we have practically to regard as pathognomic, is the presence of the tubercle bacillus. The doctrine of to-day reads, every neoplasm that contains the bacillus of tuberculosis is tubercle, and in every tubercle the bacillus must be present, however, sparingly.

Great progress has of late been made in the histogenesis of tuberculosis, by the aid offered by the tubercle bacillus, and by the discovery of new methods of hardening and staining. These methods were inaugurated by Flemming in his search for the evidences of nuclear division, and have been constantly extended and improved. The belief that had existed for some time, under the influence of Cohnheim's exudation theory, that the epithelioid and giant cells of tubercle are produced from the emigrated white blood cells, has been essentially shattered by the experiments of Baumgarten.

Baumgarten introduced bits of tuberculous tissue into the anterior chamber of the eye of guinea-pigs,

and allowed the infection to progress for varying lengths of time, when the animals were killed, and the tissue subjected to the modern methods for the detection of karyokinesis. On the second day there begins to be an increase in the number of bacilli, which spread into the neighboring tissue. The first signs of the new tubercle are epithelioid cells, which are seen to be produced from the fixed tissue cells by karyokinesis, and not from the leucocytes or small, round cells. Indeed, the leucocytes are not observed until a later period in the development of the tubercle, and no karyokinesis has been seen in them at any stage. Hence Baumgarten regards the epithelioid cells as derived from a proliferation of the fixed tissue cells, and not, as had been supposed, from the leucocytes. It has been doubted whether we are yet justified in regarding the epithelioid cells as in all instances derived from the fixed cells alone, and the history of tuberculosis, with its ever changing beliefs, may properly urge upon us caution in our positive assertions. Nevertheless, the experiments of Baumgarten have proved conclusively that the emigrated white blood cells bear a subordinate part in the development of the tubercle, and that the normal cells of the affected part are the first to be impressed by the virus, which causes them to assume the epithelioid shape. Next occurs the infiltration of the tissue with leucocytes, which may be present in greater or lesser numbers. When the infiltration with leucocytes has reached its acme, there begins to be a degeneration and death of the cells forming the tubercle. The leucocytes are probably the first to degenerate, they refuse to become stained, and a molecular detritus results. The epithelioid cells are the next victims to the degeneration, their protoplasm begins to shrivel up, and a coagulation necrosis is produced. A further step in the

degeneration is a softening of the necrotic mass, and the appearances of a suppuration are falsely produced. But there is no suppuration in tubercle strictly speaking. No pus cells are found with the microscope in pure tubercle, and there can only be a real suppuration when the tuberculosis is complicated with a septic process.

The histogenesis of the Langhans giant cells has been the subject of much controversy. The best belief of to-day is that they are formed not by confluence of several cells, but by nuclear proliferation of a single cell, with failure of the protoplasm to divide. According to Weigert's view, the Langhans cell represents a tubercle in miniature. The centre of the cell undergoes a partial coagulation necrosis, while a proliferation of the nuclei occurs faster than the cell body can divide, thus giving us the picture of a single cell with nuclei arranged along its edge, and a homogeneous centre of necrosis. The failure of the protoplasm to divide so fast as do the nuclei, is probably caused by the irritant not being powerful enough to carry the process of cell proliferation beyond its first stage, that of a division of the nucleus. The irritant in the case of tuberculosis is the tubercle bacillus, and if the bacilli are present in great numbers, the Langhans cell is not found, as the cell proliferation occurs so quickly that the cell division keep space with the nuclear division. This theory is strikingly supported by the case of lupus, where the bacilli are very sparingly present, and where for this reason the number of Langhans cells is very large — much larger than in acute miliary tuberculosis, for example, where the whole process is accelerated, and the bacilli are found in great numbers. Furthermore, the Langhans cells often contain bacilli, situated along the periphery, the part that still lives, and to which they turn for nourishment when the centre has become necrotic.



The theory of Metschnikoff with regard to the Langhans cells of tubercle should be mentioned, on account of the attention that it has excited, and of the ingenuity with which its originator has argued its claims. His theory is that the protection of the organism against many species of bacteria lies in the white blood corpuscles, which seek out the bacilli for their nutriment. The cells that thus receive and feed upon the bacteria, he has called phagocytes, and to this class the Langhans giant cells of tubercle belong. A struggle for existence is constantly taking place between the cells and the micro-organisms, and the bacilli when overwhelmed by their antagonists, are subjected to an intra-cellular digestion by which they are annihilated. Able supporters have rallied to Metschnikoff's aid in his phagocyte theory; but without entering further into the controversy that has arisen, it must be said that the active characteristics that the Langhans cell must possess in order to carry on its warfare with the tubercle bacilli, have not been satisfactorily proved, and that the weight of authority is not in favor of this theory.

Turning now to the special features presented by cutaneous tuberculosis, the first form to consider is:

#### MILIARY TUBERCULOSIS OF THE SKIN,

as this is the form that represents almost exactly the tubercle of internal organs. It has been called by the French "*tuberculose ulcéreuse*," but as the property of ulceration is common to many forms of cutaneous tuberculosis, the better title is that of miliary tuberculosis, on account of the almost constant presence of miliary nodules in process of rapid necrobiosis. Clinically this form consists of painful ulcers situated at the juncture of the mucous membrane with the skin at the entrance to the mouth, nose, anus and vagina,

and also upon the ear, in patients suffering from pronounced tuberculosis of internal organs. This form is also met with on the mucous membrane alone, and rarely attacks the skin except by extension outward from mucous surfaces. The edges of the ulcer are characteristic, being made up of a series of small indentations, looking as if punched out. Miliary tubercles in the form of yellowish-white transparent nodules can usually be seen in parts of the ulcer. The lesions are rapidly progressive, from a degeneration of the miliary tubercles, and from the confluence of the small ulcers. To Chiari and Jarisch are due the first accurate descriptions of this form, at a time when the tubercle bacillus had not been discovered. Chiari's observations prove the rarity of these ulcers for they were found in only five cases out of a total of 7,000 autopsies, sixty per cent. of the subjects of which were tuberculous.

These lesions have not, so far as my knowledge extends, been studied in the light of the modern histological methods. But all the pathological examinations that have been made, tend to prove the similarity of their structure to that of the miliary tuberculosis of internal organs. The cutis is found to be filled to a considerable depth with foci of small, round cells, with occasional epithelioid and Langhans giant cells. In the centre of these foci the necrosis has progressed rapidly, so that upon macroscopical examination the appearances of softening and cheesy degeneration are apparent. The tubercles often by their coalition form masses of softened and necrotic tissue, in which the evidences of unaltered granulation tissue can only be found in the outlying parts.

In the number of bacilli found in this miliary form there is, I am convinced, a further analogy with the miliary tubercle of the internal organs. In the cases

that I have examined they were present in large numbers, in one every field contained enormous masses, and this accords with the experience of Riehl, Doutrelepout and others.

This form has often been classed as a true tuberculosis of the skin, and offered as a powerful argument against the tuberculous nature of lupus, on the ground that the bacteriological and histological features of lupus differ in many respects from this miliary form. That this form presents characteristics not seen, as a rule, in lupus, is freely admitted, but the differences are just those that distinguish an acute from a more slowly progressive tuberculosis of other parts. The process in the miliary form runs a more rapid course. The cells are speedily transformed into masses of necrosis of a cheesy consistency, and the cause of this accelerated degeneration lies in the great numbers of tubercle bacilli, — phenomena that have been shown to be the rule in acute miliary tuberculosis.

#### SCROFULODERMA.

The term scrofuloderma is used to describe those cases of tuberculosis where the subcutaneous tissue and the lower portions of the corium, are the seat of the morbid process. Very commonly the starting point is a lymph gland, in which the tuberculous material is formed under the influence of the bacilli, becomes necrotic, and finally breaks into the overlying tissues. Where several lymph glands are involved, deep ulcers with fistulæ of various lengths are often produced. The anatomical character of scrofuloderma differs in no essential way from the tuberculosis of internal organs. A granulation tissue of small round and epithelioid cells, with a moderate quantity of Langhans giant cells, has its seat in the subcutaneous tissue, becomes degenerated, and may break through

the thinned and tense layers of the epidermis above, giving rise to the well-known ulcer with soft undermined edges. The degeneration is usually much farther advanced than in lupus, large areas of necrotic, softened tissue being usually visible under the microscope. Experiment by inoculation has, as has been said, proved beyond a doubt that these scrofulous glands and ulcers are a tuberculosis of the subcutaneous tissues. The specific tubercle bacilli are always present. Their detection may, in some instances, be a matter of considerable difficulty; in others they are very abundant, and in general they are much more numerous than is the case in lupus, but not so thickly sown as in the miliary form just considered.

#### LUPUS.

In lupus we have a tuberculous affection, having its starting point in the corium, affecting primarily the lower portions, progressing upward by extension of the foci of disease, and causing in most instances secondary and non-specific alterations of the epithelial elements. Before the discovery of the tubercle bacillus, histological investigation had already pointed out with much clearness the resemblance existing between the anatomical features of lupus and tuberculosis. Friedländer contributed more than all others to a correct appreciation of this similarity, and argued that the points of difference were not distinctly defined enough to separate the two affections. A considerable controversy then arose between the advocates and opponents of the identity of the two affections on anatomical grounds. Baumgarten pointed out that the cheesy degeneration, so constant in tubercle, was wanting in lupus; that lupus tissue presented less epithelioid and more giant cells; that lupus was more vascular, gave rise to a greater formation of connective tissue, did



not present so sharply defined miliary nodules, and was capable of direct suppuration. For these anatomical reasons he considered that lupus should be separated distinctly from tuberculosis. These points of difference, that are true in the main, are now cited to prove the identity rather than the dissimilarity of the affections. Suppuration, however, cannot be claimed as an attribute of lupus, any more than of tuberculosis, as Neisser has pointed out, and as is now generally acknowledged. What we have been accustomed to call suppuration is in reality a breaking down and softening of the granulation tissue. A true suppuration often occurs, but only when a septic process is engrafted on the tuberculous tissue. With regard to the other objections of Baumgarten, they are precisely the points of difference between a rapidly progressive and a more chronic and less virulent process. "Cheesy degeneration," the synonym for an advanced necrobiosis, is not seen in lupus, on account of its slow progress and the small number of bacilli that are present. Whether or not the soil is here unfavorable to their existence, as has been often suggested, they are found in much smaller numbers in cutaneous than in most other forms of tuberculosis. Miliary cutaneous tuberculosis offers the sole exception to this rule, as here the bacilli are usually found in great numbers, and therefore, as would be expected, the tissue presents anatomically a more advanced necrosis.

The larger representation of giant cells and the smaller number of epithelioid cells as seen in lupus, are also characteristics of the more slowly developing forms of tuberculosis, as has been shown by experimentation upon animals, by feeding them with attenuated cultures of tubercle bacilli. In these experiments a very slow and sparse proliferation of the bacilli takes place, and the neoplasm does not progress beyond the

stage of the primary epithelioid cell tubercle, or to one verging upon the lymphoid cell tubercle — much the same appearances that we meet with in lupus.

The histogenesis of the Langhans cell has already been referred to in speaking of tuberculosis generally, and the increased numbers of these cells in lupus was evidenced in support of the belief that they are produced when the specific irritant is not powerful enough to effect a division of the cell protoplasm so fast as the nuclei are divided, — the specific irritant being the tubercle bacillus, and sparingly represented in lupus tissue.

Thus, it should be emphasized, that from a purely anatomical standpoint, lupus cannot be separated from tuberculosis. Baumgarten himself, who, as has been seen, was one of the chief opponents of the tuberculous theory from anatomical reasons, declares in his textbook that not the shadow of a doubt can now exist of its true tuberculous nature.

From the experiments that have been alluded to as proving that the epithelioid and giant cells of tubercle are in the main derived from a proliferation of the fixed tissue cells, and not from the emigrated white blood corpuscles, we may confidently assume that the newly-formed cells of lupus are produced in the same way. The first appearance of the lupus tissue is found to be an accumulation of cells, situated about the capillaries and lymph channels, in many cases representing a growth of the adventitia of these vessels. But all connective tissue cells that are affected by the virus of tuberculosis are capable of this metamorphosis, and in view of Baumgarten's experiments, the possibility that the epithelial glandular elements may also take part in the process cannot be excluded. Few studies of the histogenesis of lupus cells have been made in the light of the newer methods of staining and of the

conclusions derived from experiments upon the iris. Unna in a recent paper has published the results of his investigations in this direction. He regards the epithelioid cells of lupus as identical with the "plasma zellen" of Waldeyer, and as distinct from Ehrlich's "mast zellen." These plasma cells, he says, represent the first stage of the cutaneous tubercle, and are not derived exclusively from the endothelium of the capillaries, but from any of the fixed connective tissue cells. He finds nowhere any evidence of the transformation of wandering cells into epithelioid cells, as has been heretofore assumed; the few wandering cells found in the vicinity of the process are sharply distinguished by their small size and by their deeply-stained nuclei, from the epithelioid or plasma cells.

A point of considerable interest in Unna's investigations is his claim that the agglomerations of small, round cells found at the periphery of the lupus nodule are not leucocytes, as is even now assumed, but early derivatives of the epithelioid cells, as is shown by methods of protoplasmic staining. So much, at all events, seems to be settled — that the rôle of the leucocytes in lupus, as well as in other chronic inflammatory processes, has been greatly exaggerated, and that the fixed tissue cells are, at least in the main, the parents of the epithelioid and giant cell formations.

The next stage in the history of the lupus tubercle is the degeneration of the newly-formed cells and of the fibrillary tissue. The cells lying in the centre of the nodule are the first to be affected, their protoplasm becomes homogeneous, while the nuclei lose to a certain extent their susceptibility to staining. Following Weigert, the cells in lupus, as in internal tuberculosis, are regarded as undergoing a coagulation necrosis. Unna opposes this view, on the ground that no coagulation of the protoplasm can be determined, and that

there is no death, as yet, of the cell. However this question may be decided, the process is a degeneration of the tuberculous elements under the toxic influence of the bacteria, and represents the first stages of a necrosis, that is, on account of the small numbers of the bacilli, of slow progression — a stage that we never see in the acute forms.

Together with this degeneration taking place in the epithelioid cells, there is also a regenerative process. The cells are capable of proliferation, when not affected by the virus to the extent of advanced degeneration, and may finally become converted into connective tissue. In this manner is produced the lupoid scar-tissue, that takes the place of the lupus nodule, in the process of healing. Unna, in his work just referred to, regards the scar-tissue in cases of spontaneous healing of lupus infiltrations as different from that following an ordinary loss of tissue, in the fact that there is never a reproduction of elastic fibres, that the connective tissue is never arranged in intersecting bundles, but is placed horizontally to the surface, and that it contains numerous large "cell spindles," rich in protoplasm, which upon section give the skin a striped appearance. Hence he regards this cicatricial tissue as a true lupoid tissue, and not an indifferent substitute for the absorbed tuberculous elements.

An advanced stage of the regenerative process is seen in the elephantiasis that occurs in lupus. Here the tendency to the formation of new connective tissue is so great, and dominates the degeneration to such a degree, that large portions of the body are converted into dense masses of hypertrophied fibrous tissue, containing foci of degeneration to a greater or lesser extent, and presenting clinical appearances quite similar to those of advanced elephantiasis. This formation of



new connective tissue in greater or lesser degree as compared with the necrobiosis is one of the causes of the multiplicity of clinical forms exhibited by the affection.

Another complication of lupus is the proliferation of epithelial elements that may take place. So far as our knowledge of the process extends, we must regard these phenomena as secondary and non-specific, caused by the irritation produced by the new formation, and analogous to the epithelial activity in syphilis and other chronic inflammatory processes. The rete may extend its interpapillary prolongations deep into the corium, and with the outgrowth of the papillæ, that is so constantly allied to the epithelial proliferation in all papillomata, the clinical forms of lupus papillaris, verrucosus are produced. A proliferation of the glandular elements may also take place, as was emphasized long since by the studies of Lang.

When the tuberculous infiltration of the corium has reached a certain grade of intensity and the overlying epidermis has become stretched and thinned by the pressure from below, there frequently results a fracture of the epidermis, and the tuberculous foci are laid bare, giving rise to the forms of lupus ulcers. In these instances there frequently, if not usually, exists a complication with a septic process. To the presence of the pus micrococci we must refer all true suppuration that attends a lupus lesion. The pus micro-organisms are very readily engrafted upon cutaneous lesions of any nature, and the tuberculous lesion shares with others the liability to this complication.

#### TUBERCULOSIS VERRUCOSA CUTIS.

The last form of cutaneous tuberculosis, the anatomy of which we have to consider, is that affection first accurately described by Riehl and Paltauf, under the

name of tuberculosis verrucosa cutis, a form nearly or quite identical with the anatomical wart so often found on the hands of those engaged in dissecting rooms and at the autopsy table. As described by Riehl and Paltauf the anatomical characteristics consist of greatly elongated and enlarged papillæ, covered with a thickened, lamellated horny layer, which also fills up the depressions between the papillæ. Between the cornified epidermal layers are found dried masses of exudation, with nuclei that are partially stained, and heaps of granular detritus. The interpapillary prolongations are hypertrophied and extend deeply into the corium in many places. The principal pathological changes are found in the upper layers of the corium, in the papillæ and adjoining layers, which are filled with foci of closely aggregated cells. These foci consist of a granulation tissue made up of round cells at the periphery, large epithelioid and Langhans cells toward the centre, while the centre itself in the majority of cases is formed of a necrotic mass, indistinctly defined at its border. In a word, the histological appearances of tubercle are well defined. Besides these tubercles, foci of suppuration are also found at the points where the epidermis has penetrated most deeply, which finally break through the overlying tissue and form small crypts filled with horny masses from the continued growth of the epidermis. The tubercle bacillus was constantly found in the nodules of granulation tissue. On the average, more bacilli were found than in lupus, but less than in the miliary cutaneous form. Micrococci were found in all the parts where there was an acute inflammation and suppuration.

These observations of Riehl and Paltauf have been verified by the most competent observers. The limits of their original description have been enlarged, in that these wart-like patches have been shown to occur

not only in adults who have had to do with animals and animal products, but in children and in people who have been exposed to direct infection from tuberculous excretions. The only question that can arise is as to the propriety of separating these cases from lupus verrucosus, a form which they often resemble very much both clinically and anatomically.

My interest in this form was excited some years ago and my conclusions are drawn from a considerable number of examinations of lesions, or portions of lesions, removed by the cutaneous punch and hardened and stained in various ways.

The occurrence of foci of acute inflammation immediately below the rete, and the formation of miliary abscesses was emphasized by Riehl and Paltauf as one of the characteristics of this as distinguished from other forms of cutaneous tuberculosis, but was regarded as a secondary phenomenon and due to an invasion of the tissues by colonies of micrococci. In the more typical lesions, those first described by these authors as occurring upon the hands of adult butchers, cooks, etc., as well as in the anatomical wart, these inflammatory complications are indeed most marked. In many papillary growths, however, that undoubtedly belong to this class, this secondary inflammation is very slight or totally wanting, as was verified in a number of lesions that exhibited microscopically the histological appearances of tuberculosis and contained the tubercle bacillus. It may be fairly said, I think, that these inflammatory appearances are frequently found engrafted upon a tuberculosis verrucosa cutis, but their occurrence, in my experience, is not sufficiently constant to render their absence a point of consequence, and in any case they are secondary phenomena. They have not been present to any extent in the cases that I have examined occurring in children upon the hands, elbows,

knees, etc., in the form described many years ago by Dr. McCall Anderson, under the title of lupus or scrofuloderma verrucosum. The histological appearances here give us a picture of nests of epithelioid and Langhans giant cells in the upper layers of the corium, with a papillary hypertrophy and an increase of cornified epithelium. Nor were these inflammatory appearances present in several cases of verrucous tuberculosis upon the bodies of people suffering from lesions of scrofuloderma or lupus of other parts. They seem to occur most frequently in the cases that present clinically the features of a typical verruca necrogenica.

With regard to the numbers of bacilli found, I have not been so fortunate as the writers quoted. While the detection of the specific micro-organism has been a comparatively easy matter in some instances, in others it has required a long and laborious search, equal to that demanded for their detection in lupus; and so far as my own researches go, I have not been able to demonstrate a striking divergence from lupus in this regard.

The chief anatomical characteristic that tuberculosis verrucosa affords in distinction from the papillary growths of lupus, is the *situation* of the tuberculous neoplasm. While the foci of granulation tissue lie in the lower and middle portions of the corium in lupus, in tuberculosis verrucosa, they are quite constantly found in the upper papillary layers, usually in the papillæ themselves, and in this respect my experience accords quite exactly with that of Riehl and Paltauf. It must also be admitted that in the form under consideration, the papillary outgrowth occurs at a very early period, perhaps at the very beginning of the affection, while in lupus it is met with most frequently at a later period, when the tissues have become broken down and ulceration has taken place.



Anatomically, therefore, this affection differs from lupus papillaris chiefly in the superficial seat of the process. Many transitional forms may occur, and it may often be difficult to say, from a microscopical examination alone, which of the two varieties we have before us. Riehl and Paltauf have undoubtedly brought into the limits of tuberculosis certain affections that were regarded before as doubtful or classed under other headings, and their work must be regarded as a distinct addition to our knowledge of the disease. For the present, at least, tuberculosis verrucosa cutis should be accorded a separate place among the varieties of this disease. Granting that the anatomical distinctions from a verrucous lupus are often slight, we have still the fact that these lesions were not, until the microscope taught us their histology, commonly classed with tuberculosis or lupus. A further argument in my mind for separating them from lupus, lies in the fact that the clinical evidence in these cases points to their being produced by *direct* inoculation, — a mode of infection that cannot as yet be demonstrated in a large number of lupus cases.



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